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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/549,594	09/19/2005	Zhikuan Wang	63795.8008.US00	7722
34055	7590	09/03/2010		
PERKINS COIE LLP POST OFFICE BOX 1208 SEATTLE, WA 98111-1208			EXAMINER NGUYEN, NGOC YEN M	
			ART UNIT 1793	PAPER NUMBER
			NOTIFICATION DATE 09/03/2010	DELIVERY MODE ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentprocurement@perkinscoie.com

# Office Action Summary

**Application No.**

10/549,594

**Applicant(s)**

WANG ET AL.

**Examiner**

Ngoc-Yen M. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 February 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 21-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 21-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-946)
- 3) ☐ Information Disclosure Statement(s) (PTO/SI/200)
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date: \_\_\_\_\_

### DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 10, 2010 has been entered.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 21-28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 21, it is unclear if the "primary potassium chromate" in the "separating" step is the intended product "chromate" as mentioned in the preamble; also, the limitation "an aqueous solution of potassium hydroxide with a concentration ranged from 0 to 30% by weight" in the "leaching" step is indefinite because at "0%", the solution is not an aqueous of potassium hydroxide.

In claim 22, there is no clear antecedent basis for "the primary chromate products" (plural form, it should be note in claim 21, the primary chromate product is in singular form); for "the precipitates" in the "adjusting pH" step. It is also unclear what is required by "after crystallizing, filtering, and drying mother liquor", i.e. does the

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evaporating step result in the "crystallizing", where is the mother liquor coming from, what is being dried, the chromate crystal or the mother liquor.

In claim 24, it is unclear if "the potassium hydroxide" refers to the potassium hydroxide in the decomposing step or the leaching step or both.

In claim 25, it is unclear what needs to be done to obtain the "potassium hydroxide aqueous solution" from the "potassium hydroxide liquor".

In claim 26, "a potassium hydroxide aqueous solution with a concentration ranged from 0 to 20% by weight" is indefinite for the same reason as stated above for claim 21.

In claim 28, there is not clear antecedent basis for "the aqueous solution obtained as the mother liquor".

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 21, 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okabe et al (3,859,412).

Okabe '412 discloses a process for producing alkali metal chromates from a chrome ore which comprises reacting at a temperature of 400° to 700°C a chrome ore with an alkali metal hydroxide in a molten state and in the presence of from 1 to 2.5

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moles of an alkali metal salt of a nitrogen oxyacid per mole of the  $\text{Cr}_2\text{O}_3$  present in said chrome ore, said alkali metal hydroxide being present in an amount of more than 2 moles per mole of the  $\text{Cr}_2\text{O}_3$  present in said chrome ore, and leaching the resulting alkali metal chromate from the reaction product with water or a dilute aqueous solution of an alkali metal chromate (note claim 1). The "alkali metal" as disclosed in Okabe '412 fairly teaches potassium (note Example 5). Water is considered the same as "an aqueous solution of potassium hydroxide with a concentration of 0%".

Okabe '412 further teaches that the alkali metal hydroxide is used in an amount of from 10 to 25 moles per mole of  $\text{Cr}_2\text{O}_3$  contained in said chrome ore (note claim 4). Depending on the  $\text{Cr}_2\text{O}_3$  content in the ore, the weight ratio, corresponding to the above mole ratio, between the alkali metal hydroxide and the ore would vary; however, Okabe '412 does disclose that weight of the alkali metal hydroxide can be more than 2 times the weight of the ore (note Table 1, run 1-4 and Example 5). In any event, it would have been obvious to one of ordinary skill in the art to optimize the amount of hydroxide used in the process of Okabe '412 to obtain the best results.

The alkali metal salt of the nitrogen oxyacid is sodium nitrate, potassium nitrate, lithium nitrate, sodium nitrite, potassium nitrite or lithium nitrite (note claim 2). The potassium nitrite is considered as the claimed oxidant. When nitrite is used, based on the chemical reaction 4 (last reaction in column 5), the stoichiometric nitrite to chromium oxide ratio is 2, thus, the range of "1 to 2.5" as disclosed in Okabe (note claim 1) overlaps the claimed range of "equal to or above stoichiometric amount". With respect to the encompassing and overlapping ranges previously discussed, the subject matter

as a whole would have been obvious to one of ordinary skill in the art at the time of invention to select the portion of the prior art's range which is within the range of the applicants' claims because it has been held prima facie case of obviousness to select a value in a known range by optimization for the results. *In re Boesch*, 205 USPQ 215. Additionally, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness. *In re Malagari*, 182 USPQ 549.

As shown in Table 3 in column 10, at lower temperature, it requires longer reaction time, i.e. 5 hrs at 400°C, 3 hrs at 600°C. The exemplified values of 1-5 hrs are well within the claimed range of "1 to 20 hours".

Okabe '412 further discloses that the chrome ore which can be used generally comprises predominantly chromite having a composition (by weight) of 45-65% Cr<sub>2</sub>O<sub>3</sub>, 10-26% FeO, 5-15% Al<sub>2</sub>O<sub>3</sub>, 6-15% MgO together with a minor amount proportion of gangue minerals (note column 4, lines 15-21). Thus, after the reaction step, the reaction product would inherent contain the ferrous residue in addition to the Cr<sub>2</sub>O<sub>3</sub>.

After completion of the reaction, the reaction product is leached with water to obtain an aqueous solution of a mixture of alkali metal chromates and alkali metal hydroxide as a leaching liquid (note column 5, lines 22-26). Since the amount of alkali metal hydroxide used and the concentration of potassium hydroxide solution used to leach the reaction product (0%) in Okabe '412 are similar or within the claimed ranges,

the slurry obtained after the leaching step in Okabe '412 would have a concentration of potassium hydroxide that is similar or within the claimed range.

Okabe '412 further teaches that the desired alkali metal chromates can then be precipitated from the leaching liquid by concentrating the liquid or by adding an additional amount of an alkali metal hydroxide to decrease the solubility of the alkali metal chromates in the leaching liquid, separating the precipitated alkali metal chromate by filtration to obtain the desired alkali metal chromate and at the same recycling the mother liquor containing the alkali metal hydroxide to the initial reaction of the chrome ore with the alkali metal hydroxide and an alkali metal salt of nitrogen oxyacid (note column 5, lines 26-36). It would have been obvious to one of ordinary skill in the art to optimize the amount of water (in the alkali metal hydroxide) in the reaction of the chrome ore in order to carry out the process of Okabe '412 in a molten state at the desired temperature to effectively produce alkali metal chromate.

The percent production of sodium chromate (percent utilization of  $\text{Cr}_2\text{O}_3$  contained in the ore) can be up to 99.5% (note Table 3, 400°C at 5 hrs), which considered the same as the claimed "recovery rate of chromium approaches 100%". At this percent production, the chromium content in ferrous residue or any waste would inherently be lower than 0.5% by weight. It would have been obvious to one skilled in the art to optimize the reaction temperature and the reaction time in the process of Okabe '412 to obtain the desired percent production of sodium chromate.

Claims 21-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over CN-1,240,763 in view of Okabe '412.

CN '763 discloses a process for producing sodium chromate and sodium bichromate by reacting chromium ore, caustic soda in the presence of pure oxygen at a temperature of 500-600°C for one hour, the ratio of chromium ore to sodium hydroxide is 1:3. The high temperature molten product undergoes a series of physical and chemical changes and the trivalent chromium in the chromium ore will oxidize to form hexavalent chromium. The obtained hexavalent chromium mixture is then leached with water, at this time the  $\text{Na}^+$ ,  $\text{CrO}_4^{2-}$  and  $\text{OH}^-$  of the mixture are dissolved into the water. The other non-dissolvable substances will exist in solid state. The residue (iron cinder) is separated from the liquid solution and sodium chromate is crystallized from the liquid solution. The sodium chromate is recovered and subjected to purification process which includes dissolving in water, acidifying (using sulfuric acid), evaporation and crystallization as required in the instant claim 22 (note Preferred embodiment 1, page 9, last paragraph to page 12, first paragraph of the English translation and claims 1, 3). CN '763 fairly suggests that some of liquid streams can be recycled (note Figure 2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the process conditions, such as those mentioned above, in the process of CN '763 in order to obtain the best results.

CN '763 teaches that when the amount of sodium hydroxide used is less, the liquidity of the high-temperature molten product is not as good as compared to when a higher amount of sodium hydroxide is used, however, the production cost will slightly



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decrease (note Preferred embodiment 2). When the amount of oxygen used increases, the oxidation is faster and the production rate is higher (note Preferred embodiments 2-4). Thus, it would have been obvious to one of ordinary skill in the art to optimize the process conditions in CN '763 to obtain the best results.

CN '763 discloses that the mother liquor can be recycled back to the chromite ore decomposition step. Even though CN '763 does teach that water (at least some) can be removed before the recycling step, however, it would have been obvious to one skilled in the art to recycle the mother liquor directly to the decomposition step because at high temperature in this step, the water would inherently be removed to eventually form the molten mixture as desired in CN '763.

CN '763 teaches that the use of oxygen as the oxidizing agent increases the oxidation speed and overcomes the problems encountered when other oxidizing agents, such carbon dioxide, and solid oxidizing agent were used (note translation, paragraph bridging pages 8-9).

Thus, it would have been obvious to one skilled in the art to use other oxidizing agent, i.e. eliminate the use of the oxygen as the oxidizing agent, with the loss of the advantages from using the oxygen as disclosed in CN '763.

The differences are CN '763 only discloses making sodium chromate and the temperature is a little higher than the claimed range.

Okabe '412 is applied as stated above.

Okabe '412 fairly teaches that sodium chromate and potassium chromate are analogous chromates and they can be produced by the same method, such as by

treating chrome ore with an alkali metal hydroxide in the presence of an oxidant (note claim 1 and paragraph bridging columns 1-2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the process of CN '763 to produce potassium chromate, instead of sodium chromate because Okabe '412 fairly teaches that these two compounds can be made by the same method.

Okabe '412 is further applied to teach that for a process of producing alkali metal chromate from a chrome ore using an alkali metal hydroxide, at a lower temperature, the reaction proceed slowly thereby requiring a prolonged period of time in order to ensure a high utilization of the chromium; however, at high temperature, the heat supply requirements increase thereby making the process uneconomical, at the same time, the corrosion due to the alkali metal hydroxide in the apparatus and other materials increases (note column 5, lines 5-14). From Table 3, Okabe '412 fairly teaches that the reaction temperature and the reaction time can be optimized to maximize the percent production of sodium chromate, thereby minimizing the amount of chromium lost in ferrous residue or in any other byproducts.

It would have been obvious to one of ordinary skill in the art to optimize the reaction temperature and the reaction time for the process of CN '763, as suggested by Okabe '412 to maximize the percent production of sodium chromate with the lowest cost of carrying out the reaction (by operating at the lowest temperature possible) and with shortest possible time for the process.

Claims 21, 23-25-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over CN 1,226,512 in view of Okabe '412.

CN '512 discloses a process for producing chromate by oxidative decomposing a chromite in NaOH molten salt liquid flow medium, water leaching to obtain a  $\text{Cr}^{+6}$  leaching solution, crystallizing chromate crystals, the mother liquor is recycled to the molten salt reaction (note claim 1).

The temperature for the decomposing step is 500-550°C and the amount of base to ore is 3:1 to 6:1 and the reaction time is 1-6 hours (note translation, page 5, item (i)).

For the other process conditions, without a showing of criticality or unexpected results, it would have been obvious to one of ordinary skill in the art to optimize the process conditions in CN '512 in order to obtain the desired chromate product.

The differences are CN '763 only discloses making sodium chromate and the temperature is a little higher than the claimed range.

Okabe '412 is applied as stated above to teach that sodium chromate and potassium can be produced by the same process and the reaction temperature can be optimized along with the reaction time to obtain the best results.

Claims 22, 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okabe '412 as applied to claims 21, 23-25 above, and further in view of CN '763.

The difference not yet discussed is Okabe '412 does not disclose the same steps for purifying the chromate product.

CN '763 is applied as stated above to teach a conventional process of purifying chromate.

It would have been obvious to one of ordinary skill in the art to use the process of purifying the chromate, as suggested by CN '763, for the process of Okabe '412 because such process is a conventional for purifying an analogous product.

Claims 22, 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over CN '512 in view of Okabe '412 as applied to claims 21, 23-25 above, and further in view of CN '763.

The difference is CN '512 does not disclose the same steps for purifying the chromate product.

CN '763 is applied as stated above to teach a conventional process of purifying chromate.

It would have been obvious to one of ordinary skill in the art to use the process of purifying the chromate, as suggested by CN '763, for the process of CN '512 because such process is a conventional for purifying an analogous product.

Applicant's arguments with respect to claims 21-28 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner is currently on a Part time schedule schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ngoc-Yen M. Nguyen/  
Primary Examiner, Art Unit 1793

nmn  
August 31, 2010